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EXAMINER	
ENTEZARI, MICHELLE M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/563,919	GOMI ET AL.
	Examiner	Art Unit
	MICHELLE ENTEZARI	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/10/06*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1 and 9 are provisionally rejected on the ground of nonstatutory double patenting over claims 1, 2, 11, and 12 of copending Application No. 11/352150. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that

copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

Current Application	Copending Application No. 11/352150
1. An image processing apparatus for processing input image data and for outputting output image data, the image processing apparatus comprising: an edge detection unit for detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction for each pixel of the input image data; an edge direction processing unit for performing smoothing processing on the image data in the edge direction for each pixel of the output image data in accordance with a detection result of the edge detection unit and for sequentially outputting pixel values corresponding to respective	1. An image processing apparatus for processing input-image data to output output-image data, the apparatus comprising: a plurality of image processing units operable to detect an edge-gradient direction having a largest gradient of a pixel value and an edge direction orthogonal to the edge-gradient direction for each pixel of the input-image data, to perform edge-enhancement processing on the input-image data in the edge-gradient direction, and to perform smoothing processing on the input-image data in the edge direction; and an integration unit operable to integrate the image data output from the plurality of image processing units to

pixels of the output image data; and an edge gradient direction processing unit for performing edge enhancement processing in the edge gradient direction on the pixel values output from the edge direction processing unit for the respective pixels of the output image data in accordance with the detection result of the edge detection unit and for sequentially outputting pixel values of the output image data.	generate the output-image data, wherein the plurality of image processing units have different characteristics set for use with detecting the edge-gradient direction and the edge direction. 2. The image processing apparatus according to claim 1, wherein the image processing unit includes: an edge detection unit operable to detect the edge-gradient direction and the edge direction; an edge-direction processing unit operable to perform smoothing processing on the input-image data in the edge direction for each pixel of the output-image data on the basis of a detection result of the edge detection unit to sequentially output pixel values corresponding to individual pixels of the output-image data; and an edge-gradient direction processing unit operable to perform contour enhancement processing

	on the pixel value output from the edge-direction processing unit in the edge-gradient direction for each pixel of the output-image data on the basis of the detection result of the edge detection unit to sequentially output pixel values of the image data.

Current Application	Copending Application No. 11/352150
9. An image processing method for processing input image data and for outputting output image data, the image processing method comprising:an edge detection step of detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction for each pixel of the input image data; an edge direction processing	11. A method of processing input-image data to output output-image data, the method comprising: performing a plurality of image processings including detecting an edge-gradient direction having a largest gradient of a pixel value and an edge direction orthogonal to the edge-gradient direction for each pixel of the input-image data, performing edge-enhancement processing on the

step of performing smoothing processing on the image data in the edge direction for each pixel of the output image data in accordance with a detection result by the edge detection step and sequentially detecting pixel values corresponding to respective pixels of the output image data; and an edge gradient direction processing step of performing edge enhancement processing in the edge gradient direction on the pixel values detected by the edge direction processing step for the respective pixels of the output image data in accordance with the detection result by the edge detection step and sequentially outputting pixel values of the output image data.	input-image data in the edge-gradient direction, and performing smoothing processing on the input-image data in the edge direction to produce processed image data; and integrating the processed image data to generate the output-image data, wherein the plurality of image processings have different characteristics set for use with detecting the edge-gradient direction and the edge direction. 12. The method of processing input-image data to output-image data according to claim 11, wherein the steps of image processing include: edge detecting including detecting the edge-gradient direction and the edge direction; edge-direction processing including performing smoothing processing on the input-image data in the edge direction for each pixel of the output-image data on the basis of a detection result of the

	edge detecting step to sequentially output pixel values corresponding to individual pixels of the output-image data; and edge-gradient direction processing including performing contour enhancement processing on the pixel value output from the edge-direction processing step in the edge-gradient direction for each pixel of the output-image data on the basis of the detection result of the edge detecting step to sequentially output pixel values of the image data.

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.
>
> Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. 101.
>
> ... a signal does not fall within one of the four statutory classes of Sec. 101.
>
> ... signal claims are ineligible for patent protection because they do not fall within any of the four statutory classes of Sec. 101.

Claim 10 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claim 10 is drawn to functional descriptive material recorded on a recording medium, as defined by "means for" language and looking to the publication of the applicant's specification, US 20080123998 A1, paragraph [0027]. Normally, the claim would be statutory. However, the specification, at paragraph [0027] the specification defines or exemplifies the claimed computer readable medium as encompassing statutory media such as optical disks, memory cards, and detachable hard disk drives as well as ***non-statutory*** subject mater such as supplied by being downloaded via a network, such as the Internet.

"A transitory, propagating signal ... is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter." (In re Nuijten, 84 USPQ2d 1495 (Fed. Cir. 2007)).

Because the full scope of the claim as properly read in light of the disclosure appears to encompass non-statutory subject matter (i.e., because the specification defines/exemplifies a computer readable medium as a non-statutory signal, carrier waver, etc.) the claim as a whole is non-statutory. The examiner suggests amending the claim to *include* the disclosed tangible computer readable storage media, while at the same time *excluding* the intangible transitory media such as signals, carrier waves, etc. Any amendment to the claim should be commensurate with its corresponding disclosure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 9, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1) further in view of Li et al. (US 20030053161 A1).

Regarding claim 1, Horie et al. disclose an image processing apparatus (image processing device and method, title) for processing input image data and for outputting output image data (corrects image data, compresses and outputs corrected image data,

col. 1, lines 35-40), the image processing apparatus comprising: for each pixel of the input image data (col. 6 lines 1-5); an edge direction processing unit for performing smoothing processing on the image data in the edge direction (smoothing is performed in the edge direction, col. 14, lines 30-40) for each pixel of the output image data (col. 6 lines 1-5) in accordance with a detection result of the edge detection unit (direction of the edge is discriminated, col. 14, lines 30-35); and an edge gradient direction processing unit for performing edge enhancement processing in the edge gradient direction (edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) for the respective pixels of the output image data in accordance with the detection result of the edge detection unit (direction of the edge is discriminated, col. 14, lines 30-35)

Horie et al. do not disclose an edge detection unit for detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction and for sequentially outputting pixel values corresponding to respective pixels of the output image data and for sequentially outputting pixel values of the output image data.

Li et al. teach an edge detection unit for detecting an edge gradient direction (use horizontal and vertical gradient to determine gradient direction [0029]) with the largest gradient of pixel values (steepest slope, [0029]) and an edge direction orthogonal to the edge gradient direction (use horizontal and vertical gradient to determine gradient

direction and the corresponding perpendicular direction of the detected edge, [0029]) and for sequentially outputting pixel values corresponding to respective pixels of the output image data (sequentially transmitted, [0026]).

It would have been obvious at the time of the invention to one skilled in the art to use the well known gradient detection method, apparatus, and program of Li et al. with the invention of Horie et al. because this is a computationally efficient way to detect edge direction ([0005]-[0006]).

Regarding claim 9, Horie et al. disclose an image processing method (image processing device and method, title) for processing input image data and for outputting output image data (corrects image data, compresses and outputs corrected image data, col. 1, lines 35-40), the image processing method comprising: an edge detection step (direction of the edge is discriminated, col. 14, lines 30-35) and an edge direction orthogonal to the edge gradient direction (edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) for each pixel of the input image data (col. 6 lines 1-5); an edge direction processing step of performing smoothing processing on the image data in the edge direction (smoothing is performed in the edge direction, col. 14, lines 30-40) for each pixel of the output image data (col. 6 lines 1-5) in accordance with a detection result by the edge detection step (direction of the edge is discriminated, col. 14, lines 30-35); and an edge gradient direction processing step of performing edge enhancement processing in the edge gradient direction (edge

enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) on the pixel values detected by the edge direction processing step (direction of the edge is discriminated, col. 14, lines 30-35) for the respective pixels of the output image data in accordance with the detection result by the edge detection step (direction of the edge is discriminated, col. 14, lines 30-35).

Horie et al. do not disclose an edge detection step of detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data.

Li et al. teaches an edge detection step of detecting an edge gradient direction (use horizontal and vertical gradient to determine gradient direction [0029]) with the largest gradient of pixel values (steepest slope, [0029]) and an edge direction orthogonal to the edge gradient direction (use horizontal and vertical gradient to determine gradient direction and the corresponding perpendicular direction of the detected edge, [0029]) and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data (sequentially transmitted, [0026]).

Regarding claim 10, Horie et al. disclose a program (recording medium for recording image processing program, title) for an image processing method (program to perform method, title) performed by arithmetic processing means for processing input image data and for outputting output image data (corrects image data, compresses and outputs corrected image data, col. 1, lines 35-40), the program comprising: an edge detection step (direction of the edge is discriminated, col. 14, lines 30-35) and an edge direction orthogonal to the edge gradient direction (edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) for each pixel of the input image data (col. 6 lines 1-5); an edge direction processing step of performing smoothing processing on the image data in the edge direction (smoothing is performed in the edge direction, col. 14, lines 30-40) for each pixel (col. 6 lines 1-5) of the output image data in accordance with a detection result by the edge detection step (direction of the edge is discriminated, col. 14, lines 30-35) and an edge gradient direction processing step of performing edge enhancement processing in the edge gradient direction (edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) on the pixel values detected by the edge direction processing step (direction of the edge is discriminated, col. 14, lines 30-35) for the respective pixels of the output image data in accordance with the detection result by the edge detection step and outputting pixel values of the output image data (direction of the edge is discriminated, col. 14, lines 30-35).

Horie et al. do not disclose an edge detection step of detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data.

Li et al. teaches an edge detection step of detecting an edge gradient direction (use horizontal and vertical gradient to determine gradient direction [0029]) with the largest gradient of pixel values (steepest slope, [0029]) and an edge direction orthogonal to the edge gradient direction (use horizontal and vertical gradient to determine gradient direction and the corresponding perpendicular direction of the detected edge, [0029]) and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data (sequentially transmitted, [0026]).

Regarding claim 11, Horie et al. disclose a recording medium (col. 1, lines 5-15) recording thereon a program for an image processing method (col. 1, lines 5-15) performed by arithmetic processing means for processing input image data and for outputting output image data (corrects image data, compresses and outputs corrected image data, col. 1, lines 35-40), the program comprising: an edge detection step (direction of the edge is discriminated, col. 14, lines 30-35) and an edge direction orthogonal to the edge gradient direction (edge enhancement performed in the

perpendicular direction to the edge, col. 14, lines 30-40) for each pixel of the input image data (col. 6 lines 1-5); an edge direction processing step of performing smoothing processing on the image data in the edge direction (smoothing is performed in the edge direction, col. 14, lines 30-40) for each pixel (col. 6 lines 1-5) of the output image data in accordance with a detection result by the edge detection step (direction of the edge is discriminated, col. 14, lines 30-35) and an edge gradient direction processing step of performing edge enhancement processing in the edge gradient direction (edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40) on the pixel values detected by the edge direction processing step (direction of the edge is discriminated, col. 14, lines 30-35) for the respective pixels of the output image data in accordance with the detection result by the edge detection step and outputting pixel values of the output image data (direction of the edge is discriminated, col. 14, lines 30-35).

Horie et al. do not disclose an edge detection step of detecting an edge gradient direction with the largest gradient of pixel values and an edge direction orthogonal to the edge gradient direction and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data.

Li et al. teaches an edge detection step of detecting an edge gradient direction (use horizontal and vertical gradient to determine gradient direction [0029]) with the largest

gradient of pixel values (steepest slope, [0029]) and an edge direction orthogonal to the edge gradient direction (use horizontal and vertical gradient to determine gradient direction and the corresponding perpendicular direction of the detected edge, [0029]) and sequentially detecting pixel values corresponding to respective pixels of the output image data, and sequentially outputting pixel values of the output image data (sequentially transmitted, [0026]).

Claims 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1) and Li et al. (US 20030053161 A1) as applied to claim 1 above, and further in view of Jiang (US 20040119884 A1).

Regarding claim 2, Horie et al. and Li et al. disclose the image processing apparatus according to claim 1.

Horie et al. and Li et al. do not disclose generating interpolated image data in the edge direction based on interpolation processing for the input image data on a line extending in the edge direction for the respective pixels of the output image data in accordance with the detection result of the edge detection unit, the edge direction processing unit sequentially outputs the pixel values corresponding to the respective pixels of the output image data by performing filtering processing on the interpolated image data in the edge direction.

Jiang teaches generating interpolated image data in the edge direction (edge directions generated with subpixel precision with interpolation, [0040]) based on interpolation processing (interpolation, [0040]) for the input image data (pixel data, abstract; region data is input, [0041]) on a line extending in the edge direction (edge direction, [0040]) for the respective pixels of the output image data in accordance with the detection result of the edge detection unit (edge detection, [0041]), the edge direction processing unit sequentially outputs the pixel values (neighboring pixel values along line are considered, [0039]) corresponding to the respective pixels of the output image data (reconstructing pixel data, abstract) by performing filtering processing on the interpolated image data in the edge direction (filtering applied along edge directions, abstract).

It would have been obvious at the time of the invention to one skilled in the art to use the well known interpolation and filtering as taught by Jiang with the invention of Horie et al. and Li et al. because this improves the robustness of edge detection (Jiang, [0026]) and allows for subpixel precision (Jiang, [0040]).

Regarding claim 6, Horie et al. and Li et al. disclose the image processing apparatus according to claim 1. Li et al. also teach smoothing along a perpendicular direction to the edge ([0010]).

Horie et al. and Li et al. do not disclose after generating interpolated image data in the edge gradient direction based on interpolation processing for the image data based on the respective pixel values output from the edge direction processing unit on a line extending in the edge gradient direction for the respective pixels of the output image data in accordance with the detection result of the edge detection unit, the edge gradient direction processing unit sequentially outputs the pixel values of the output image data by performing filtering processing on the interpolated image data in the edge gradient direction.

Jiang teaches generating interpolated image data in the edge direction (edge directions generated with subpixel precision with interpolation, [0040]) based on interpolation processing (interpolation, [0040]) for the input image data (pixel data, abstract; region data is input, [0041]) on a line extending in the edge direction (edge direction, [0040]) for the respective pixels of the output image data in accordance with the detection result of the edge detection unit (edge detection, [0041]), the edge direction processing unit sequentially outputs the pixel values (neighboring pixel values along line are considered, [0039]) corresponding to the respective pixels of the output image data (reconstructing pixel data, abstract) by performing filtering processing on the interpolated image data in the edge direction (filtering applied along edge directions, abstract).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1), Li et al. (US 20030053161 A1), and Jiang (US 20040119884 A1) as applied to claim 2 above, and further in view of Winger et al. (US 20050134730 A1).

Horie et al., Li et al., and Jiang disclose the image processing apparatus according to claim 2.

Horie et al., Li et al., and Jiang do not disclose the edge direction processing unit changes the number of taps for the filtering processing in accordance with a reliability of an edge in the edge direction.

Winger et al. teach edge direction processing unit (edge detection and directional filtering, [0037]) changes the number of taps for the filtering processing (using a different number of filter taps for vertical interpolation compared to directional interpolation [0010]) in accordance with a reliability of an edge in the edge direction (whether or not directional or vertical filtering is performed is dependent on how weak the edges are [0037]; this weak measure is seen as synonymous with a reliability measure).

It would have been obvious at the time of the invention to one skilled in the art to use the well known tap changing as taught by Winger et al. with the invention of Horie et al.,

Li et al., and Jiang because this makes the invention more adaptable to the strength of the edges.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1), Li et al. (US 20030053161 A1), Jiang (US 20040119884 A1), and Winger et al. (US 20050134730 A1) as applied to claim 3 above, and further in view of Thirumoorthy (US 7158632 B2).

Horie et al., Li et al., Jiang, and Winger et al. disclose the image processing apparatus according to claim 3.

Winger et al. further teach the changing of the number of taps (using a different number of filter taps for vertical interpolation compared to directional interpolation [0010]) for the filtering processing performed by the edge direction processing unit (edge detection and directional filtering, [0037]) is changing of the number of taps (using a different number of filter taps for vertical interpolation compared to directional interpolation [0010]) by changing a weighting coefficient in accordance with the reliability of the edge (change penalty score when edge is weak, [0057]) in the edge direction (directional filtering, [0037]) and by performing weighting addition of filtering processing results of different numbers of taps using the weighting coefficient (summing inverses of scores, [0076]).

Winger et al. do not teach changing of the number of taps in a decimal fractional part.

Thirumoorthy teaches FIR filters may be implemented using fractional arithmetic (col. 4, lines 5-10).

It would have been obvious at the time of the invention to one skilled in the art to use the well known decimal fractional changing of taps as taught by Thirumoorthy with the invention of Horie et al., Li et al., Jiang, and Winger et al. because this allows FIR filters to be implemented using fractional arithmetic so that they may be used in connection with small signals having a magnitude of less than 1.0, thus making them appropriate for use with small echo signals (Thirumoorthy, col. 4, lines 5-10).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1), Li et al. (US 20030053161 A1), Jiang (US 20040119884 A1), and Winger et al. (US 20050134730 A1) as applied to claim 3 above, and further in view of Cohen et al. (US 6337925 B1).

Horie et al., Li et al., Jiang, and Winger et al. disclose the image processing apparatus according to claim 3. Li et al. further teach using a gradient ratio to determine the direction of an edge (abstract).

Horie et al., Li et al., Jiang, and Winger et al. do not explicitly disclose the reliability of the edge in the edge direction is a ratio of a dispersion of the gradient of the pixel values

in the edge direction to a dispersion of the gradient of the pixel values in the edge gradient direction.

Cohen et al. teach the measure of confidence in the edge zone information may be calculated by calculating an average value of a difference between the estimated edge zone direction and the pixel gradient direction at each pixel over an estimated edge zone area (col. 5, lines 35-45).

It would have been obvious at the time of the invention to one skilled in the art to substitute the use of a ratio as taught by Li et al. in place of the difference as taught by Cohen et al. for the predictable outcome of determining the confidence measure, as these are considered common ways of comparing two quantities.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1) and Li et al. (US 20030053161 A1) as applied to claim 1 above, and further in view of Kojima (US 5930007 A) and Zhu (US 6681053 B1).

Horie et al. and Li et al. disclose the image processing apparatus according to claim 1, including finding the edge gradient direction.

Horie et al. and Li et al. do not disclose the output image data is image data obtained by changing a sampling pitch of the input image data, and wherein the image processing

apparatus further includes: an interpolation processing unit for performing an interpolation operation on the input image data and for outputting interpolated image data with a sampling pitch of the output image data; a blend ratio determination unit for changing a weighting coefficient for blending in accordance with a reliability of an edge in the edge direction; and a blend processing unit for performing weighting addition of the image data output from the edge gradient direction processing unit and the interpolated image data using the weighting coefficient for blending and for outputting the output image data.

Kojima teaches the output image data is image data (image quality is adjusted, abstract); a blend ratio determination unit (mixing ratio calculation unit, col. 2, lines 50-55) for changing a weighting coefficient (mixing circuit puts weights to the plurality of input signals, col. 11, lines 1-10) for blending in accordance with a reliability of an edge in the edge direction (deterioration due to recognition errors suppressed, col. 11, lines 35-45); and a blend processing unit (mixing unit for mixing results from first and second smoothing filters, col. 2, lines 50-55) for performing weighting addition of the image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and they add them together, col. 2, lines 40-45) output from the edge gradient direction processing unit (edge extracting unit output goes to mixing unit 13, Fig. 2) and interpolated image data (interpolation processing, col. 11, lines 25-30) using the weighting coefficient for blending and for outputting the output image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and they add

them together, col. 2, lines 40-45; mixing unit for mixing results from first and second smoothing filters, col. 2, lines 50-55).

It would have been obvious at the time of the invention to one skilled in the art to use the well known blending operations as taught by Kojima with the invention of Horie et al. and Li et al. because this procedure operates optimally both in an edge and a non-edge area of an image, while simultaneously maintaining desired uniformity and resolution, so that desired image quality is obtained (col. 2, lines 10-20).

Horie et al., Li et al., and Kojima disclose the claimed invention except for weighting addition of the image data output from the edge gradient direction processing unit, the output image is obtained by changing a sampling pitch of the input image data, and wherein an interpolation processing unit for performing an interpolation operation on the input image data and for outputting interpolated image data with a sampling pitch of the output image data.

Regarding weighting addition of the image data output from the edge gradient direction processing unit, Kojima teaches weighting addition of the image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and add them together, col. 2, lines 40-45) output from the edge gradient direction processing unit (edge extracting unit output goes to mixing unit 13, Fig. 2), and Horie et al. and Li et al. disclose finding an edge gradient direction as simply perpendicular to the edge direction

(Horie et al., edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40, Li et al., perpendicular direction of the detected edge, [0029]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use outputs from either the edge direction or edge gradient direction units, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse,* 86 USPQ 70

Regarding output image is obtained by changing a sampling pitch of the input image data, and wherein an interpolation processing unit for performing an interpolation operation on the input image data and for outputting interpolated image data with a sampling pitch of the output image data, Zhu teaches the output image is obtained by changing a sampling pitch of the input image data (color image is expanded to a gray scale image with triple the number of pixels as the original image, abstract), with an interpolation processing unit for performing an interpolation operation on the input image data (interleaving sub-pixels, abstract) and for outputting interpolated image data with a sampling pitch of the output image data (color image is expanded to a gray scale image with triple the number of pixels as the original image by interleaving sub-pixels, abstract; processed RGB image is output, Fig. 5).

It would have been obvious at the time of the invention to one skilled in the art to use the well known sampling pitch changes as taught by Zhu with the invention of Horie et al., Li et al., and Kojima because this can improve the image resolution (abstract).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al. (US 6735341 B1) and Li et al. (US 20030053161 A1) as applied to claim 1 above, and further in view of Kojima (US 5930007 A).

Horie et al. and Li et al. disclose the image processing apparatus according to claim 1.

Horie et al. and Li et al. do not disclose a blend ratio determination unit for changing a weighting coefficient for blending in accordance with a reliability of an edge in the edge direction; and a blend processing unit for performing weighting addition of the image data output from the edge gradient direction processing unit and the input image data using the weighting coefficient for blending and for outputting the output image data.

Kojima teaches a blend ratio determination unit (mixing ratio calculation unit, col. 2, lines 50-55) for changing a weighting coefficient (mixing circuit puts weights to the plurality of input signals, col. 11, lines 1-10) for blending in accordance with a reliability of an edge in the edge direction (deterioration due to recognition errors suppressed, col. 11, lines 35-45); and a blend processing unit (mixing unit for mixing results from first and second smoothing filters, col. 2, lines 50-55) for performing weighting addition of the image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and they add them together, col. 2, lines 40-45) output from the edge direction processing unit (edge extracting unit output goes to mixing unit 13, Fig.

2) and the input image data (N-level image data is input, Fig. 2) using the weighting coefficient for blending and for outputting the output image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and they add them together, col. 2, lines 40-45; mixing unit for mixing results from first and second smoothing filters, col. 2, lines 50-55).

It would have been obvious at the time of the invention to one skilled in the art to use the well known blending operations as taught by Kojima with the invention of Horie et al. and Li et al. because this procedure operates optimally both in an edge and a non-edge area of an image, while simultaneously maintaining desired uniformity and resolution, so that desired image quality is obtained (col. 2, lines 10-20).

Horie et al., Li et al., and Kojima disclose the claimed invention except for weighting addition of the image data output from the edge gradient direction processing unit. Kojima teaches weighting addition of the image data (smoothing filters multiply pixels within scanning aperture with a weighting constant and add them together, col. 2, lines 40-45) output from the edge gradient direction processing unit (edge extracting unit output goes to mixing unit 13, Fig. 2), and Horie et al. and Li et al. disclose finding an edge gradient direction as simply perpendicular to the edge direction (Horie et al., edge enhancement performed in the perpendicular direction to the edge, col. 14, lines 30-40, Li et al., perpendicular direction of the detected edge, [0029]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use

outputs from either the edge direction or edge gradient direction units, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse,* 86 USPQ 70.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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US 5600731 A Sezan; Muhammed I. et al.

US 5798830 A Srinivasan; Lakshman

US 6388706 B1 Takizawa; Naruo et al.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571)272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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